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Annual Summary Report

ONR Contract-Nonr-1228(19)
NR 046-786

Karl G. Henize
Principal Investigator
December 1962

Northwestern University

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Annual Summary Report
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Karl G. Henize

Under the auspices of this contract I visited Mt. Stromlo Observatory from 1 September 1961, to 8 July 1962, making observations of southern planetary nebulae, emission-line stars, and S stars. Brief descriptions of these programs and preliminary results are given in the following paragraphs.

Dr. Bengt Westerlund and I have undertaken a program of direct photography of southern planetary nebulae. This program includes some 280 nebulae, including both previously known planetaries as well as new and suspected planetaries discovered in the course of the Michigan-Mt. Wilson southern H α survey.¹ As of 1 July 1962, approximately 120 of the nebulae had been photographed. It is expected that Dr. Westerlund will complete this program during the current observing season, and that the program will be finished by August 1963.

I have obtained low-dispersion slit spectra of many of the more peculiar emission-line stars observed in the H α survey. The dispersion of the spectra range from 90 to 290 Å/mm. Spectra were obtained of a total of 108 objects, of which the types may be listed as follows:

Planetary nebulae	20
Peculiar stars (mainly P Cygni type)	26
Be stars	19
Suspected composite spectra	14
S stars	10
Suspected Wolf-Rayet stars	5
Suspected T Tauri stars	6
Diffuse nebulae in the Small Magellanic Cloud	4
Peculiar carbon stars	4

Particular attention is being given to low-excitation planetary nebulae as well as to P Cygni stars. The star HD87643 is of unusual interest; its spectrum includes broad absorption lines of hydrogen with a displacement of -1000 km/sec, sharp double emission-lines of hydrogen with little displacement,

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and strong emission-lines of FeII. This star is further observed to be involved in a small irregular nebula. Another star with a peculiar spectrum, CD-42° 11721, has been discovered to be involved in a small nebula.

With the 30-inch Reynolds reflector, I have obtained spectra of some 103 Be stars with visual magnitudes brighter than 7.0. Line structure in those showing shell spectra will be analyzed. The remainder will be included in a publication giving the general statistical characteristics of the emission lines as well as the radial velocities of the stars.

With the kind permission of Professor E. Holmberg, I obtained with the Uppsala Schmidt telescope, objective prism spectra and three-color/^{direct} plates of T Tauri groups in Chameleon and in Lupus. Twelve new emission-line stars have been discovered in the Chameleon group, bringing the total in the group to 22.

I have obtained a series of small-scale direct plates of some 150 southern S stars with the aim of determining their magnitudes and their type of light variation. In addition, spectra and photoelectric magnitudes and colors of 10 bright S stars and 4 "sodium" stars similar to GP Ononis have been obtained.

Dr. Westerlund and I have jointly obtained direct photographs of the brighter of the objects in the Small Magellanic Cloud designated as planetary nebulae by Lindsay. We find all such objects brighter than absolute photographic magnitude -3.0 to have diameters greater than 0.5 pc. and to have masses ranging from 1.6 to 33 solar masses. It therefore seems unlikely that these can be true planetary nebulae. The results of this investigation will appear in the Astrophysical Journal of April 1963.

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Dr. Westerlund and I have also cooperated in obtaining direct photographs and spectra of a peculiar nebula located between the Magellanic Clouds. Its velocity indicates it to be a member of the Clouds; its spectrum and surface brightness indicates a mass of approximately 11 solar masses; and its isolated position, far from the interstellar media of either of the Clouds, suggests that this is a star in which gas ejection is taking place.

I wish to conclude this report by expressing my thanks to Dr. Bart J. Bok and to the Australian National University. Their warm hospitality and generous support contributed very largely to the success of my programs.

Karl G. Henize
Principal Investigator

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1. The Michigan-Mt. Wilson southern H α survey is an objective/survey in the spectral region of H α and covering the entire southern sky south of declination -25° . This survey was carried by the Principal Investigator from 1948 to 1951. It is the purpose of the present project to confirm the nature of the more unusual emission-line stars and nebulae discovered during the H α survey, and to conduct deeper astrophysical investigations of those objects of special interest.

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